CONFERENCE PROCEEDINGS BOOK

INTERNAZIONALE MARMI E MACCHINE CARRARA SPA

CARRARA MARMOTEC 2016

1st INTERNATIONAL SUSTAINABLE STONE CONFERENCE

CARRARA, 20 MAY 2016

INTERNAZIONALE MARMI E MACCHINE CARRARA SPA

MIA + BSI THE NATURAL STONE INSTITUTE

Consiglio Nazionale delle Ricerche IRCES

CGT Centro di GeoTecnologie

GREEN BUILDING COUNCIL ITALIA

THE CONFERENCE IS ORGANIZED BY:

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WITH THE SUPPORT OF:

REGIONE TOSCANA

TOSCANA PROMOZIONE

SOCIETÀ GEOLOGICA ITALIANA

AIGA

Italian Journal of Engineering Geology and Environment 1

Table 1. Carrara marble physical-mechanical characteristics (on average)

Physical characteristics	Value
Bulk density	2688 kg/m3
Simple compression strength	1209 kg/cm3
Compression strength after freezing	1181 kg/cm3
Indirect Tensile Strength (Brasilian test)	174 kg/cm3
Impact strength test	73.8 cm
Moisture absorption (by weight)	0.16%

On the basis of the grain size and of chemical characteristics, several applications as SRM are possible: eg. Asphalt, cement, plaster, rubber, sealants, paper, paint, plastic, etc. Other potential applications as by-products are: aggregate for concrete; crushed materials for embankments and armoure stones. Moreover, the big chance for the future – due to solve also hydrogeological and stability problems in Carrara Basin - is treating "poor" material (called "terre") to new, performing markets.
On the basis of these information a preliminary research about Carrara Marble QW recovery was set. Two areas were sampled (Calocara and Lorano) and the sampled materials were analyzed to get information about: size distribution, density, Atterberg limits, Los Angeles test, freezing and heat test, flat and shape indexes, chemical analysis, mineralogy. At present, analysis activities are still in progress and the first results shows a good attitude for QW to be recovered.
The present research will show the state of the art and the potentiality of QW exploitation in Carrara; highlighting best practices and efficient recovery processes (technologies and techniques).

STRUCTURE FROM MOTION TECHNIQUE OF PROXIMAL-SENSING AIRBORNE DATA FOR 3D RECONSTRUCTION OF EXTRACTION SITES

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Abstract

Digital photogrammetry based on Structure from Motion (SfM) algorithms nowadays represents a low-cost, valid and rapid technique for the tridimensional detection and mapping of large areas of particular geologic-geomorphologic, natural and environmental interest.

Products derived from the photogrammetric processing, such as tridimensional point clouds, digital surface and terrain models (DSM and DTM), and high-resolution orthophotos, allow to study and monitor the territory and its productive activities. In this case study we used images captured from a small aircraft, agile and extremely inexpensive, for the 3D reconstruction of extraction sites and zones of geo-structural importance. The aircraft, called RadGyro (property of the CGT Group, University of Siena), is able to deal with complex flight plans and low altitudes in a way to make possible the detailed detection of desired features even in very complex areas. An example of this complex situation is represented by the test area here presented, located in the marble district of the Apuan Alps, the biggest and most exploited European extractive basin. The aircraft is equipped to acquire series of photos in an independent manner, using two digital cameras characterized by a full frame sensor and 35 mm fixed lens. Moreover, five GPS antennas and an inertial navigation system (INS) allow associating to each frame the position and the angular orientation of the camera. Flying at an altitude varying from 100 m to 400 m above ground level, the cameras can detect about 50 km2 and 200 km2, respectively, with a ground resolution of 3.5 cm and 10.0 cm. The exterior orientation of images can be improved, if necessary, acquiring some ground control points through traditional topographic survey. Info about the exterior orientation, associated to each frame, is therefore used to finalize the photogrammetric processing, using appropriate software. Structure from Motion techniques and algorithms allow to detect millions of "tie points" necessary for the accurate alignment of photos. The photogrammetric processing, then, is finalized by the creation of 3D point clouds, DSM, DTM and orthophotos. These products are used in this case study for the detailed analysis of the marble quarries morphology and geology and, through a multitemporal acquisition, for the assessment of the volumetric variations related to the extraction activities. Moreover, we want to point out, finally, how the RadGyro is able to provide data for environmental researches thanks to the following additional equipment: an hyperspectral camera in the range from 400 nm to 1000 nm, a thermal camera (7500 -1300 nm) and a gamma ray spectrometer equipped with detectors.